

WHAT IS CLAIMED IS:

1. A transport molecule, comprising: a dendrimer and a biologically active molecule, wherein the dendrimer comprises at least one guanidine group, at least one protonated guanidine group, at least one protected guanidine group, at least one amidine group, at least one protonated amidine group, at least one protected amidine group, at least one ureido group, at least one protonated ureido group, at least one protected ureido group, at least one thioureido group, at least one protonated thioureido group, or at least one protected thioureido group and further wherein the biologically active molecule is bonded to the dendrimer.
2. The transport molecule of Claim 1, wherein the dendrimer comprises at least one tetravalent atom bonded to at least two groups bearing terminal guanidine groups, terminal protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups.
3. The transport molecule of Claim 1, wherein the dendrimer comprises at least one tetravalent atom bonded to at least three groups bearing terminal guanidine groups, terminal protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups.
4. The transport molecule of Claim 1, wherein the dendrimer comprises a first tetravalent atom and a second tetravalent atom, wherein the first tetravalent atom and the second tetravalent atom are each bonded to at least three groups bearing terminal guanidine groups, terminal protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups,

terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups.

5. The transport molecule of Claim 1, wherein the dendrimer comprises a first tetravalent atom, a second tetravalent atom, and a third tetravalent atom, wherein the first tetravalent atom, the second tetravalent atom, and the third tetravalent atom are each bonded to at least three groups bearing terminal guanidine groups, terminal protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups.

6. The transport molecule of Claim 1, wherein the dendrimer comprises a first tetravalent atom, a second tetravalent atom, a third tetravalent atom, and a fourth tetravalent atom, wherein the first tetravalent atom, the second tetravalent atom, the third tetravalent atom, and the fourth tetravalent atom are each bonded to at least three groups bearing terminal guanidine groups, terminal protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups.

7. The transport molecule of Claim 1, wherein the dendrimer comprises at least two guanidine groups, protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups, and the transport molecule possesses a degree of symmetry such that the at least two

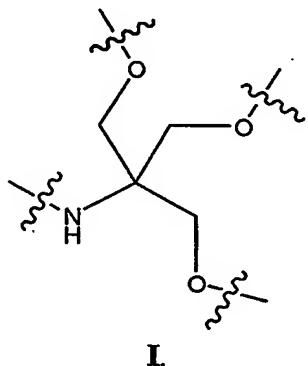
guanidine groups, protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups are in identical chemical environments when all the guanidine groups, protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups of the dendrimer are either neutrally charged or are protonated.

8. The transport molecule of Claim 1, wherein the dendrimer comprises three or more guanidine groups, protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups, and the transport molecule possesses a degree of symmetry such that each of the three or more guanidine groups, protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups is in an identical chemical environment when each of the three or more guanidine groups, protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups is either neutrally charged or is protonated.

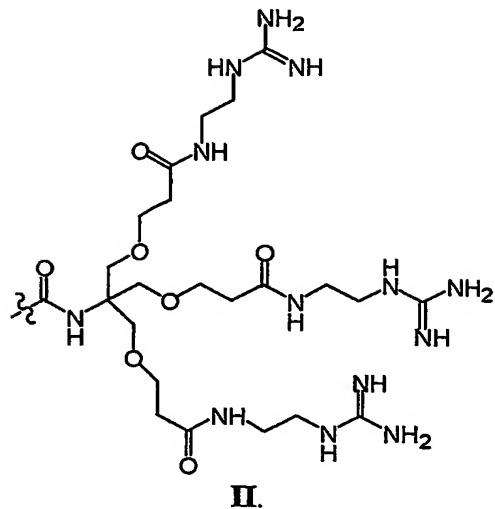
9. The transport molecule of Claim 1, wherein the dendrimer comprises 3, 6, 9, or 12 guanidine groups, protonated guanidine groups thereof, or protected guanidine groups; amidine groups, protonated amidine groups, or protected amidine groups; ureido groups, protonated ureido groups, or protected ureido groups; or thioureido groups, protonated thioureido groups, or protected thioureido groups.

10. The transport molecule of any of Claims 1-9, wherein the dendrimer comprises amide bonds but does not comprise any peptide linkages.

11. The transport molecule of any of Claims 1-10, wherein the dendrimer comprises at least one residue of tris(hydroxymethyl)aminomethane, wherein the dendrimer comprises at least one group of formula I



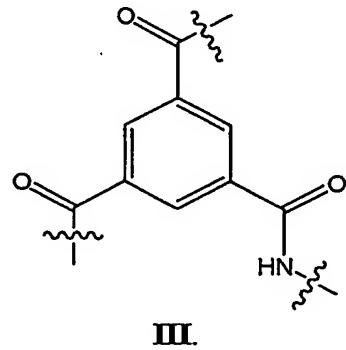
12. The transport molecule of Claim 11, wherein the dendrimer comprises at least one group of formula II or a protonated or a protected form of the group of formula II



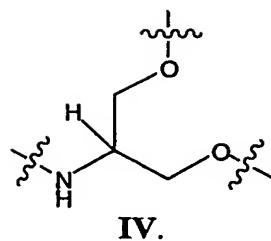
13. The transport molecule of Claim 12, wherein the dendrimer comprises one, two, three, or four groups of formula II or protonated or protected forms of the group of formula II.

14. The transport molecule of Claim 11, wherein the dendrimer comprises one, two, three, or four groups of formula I.

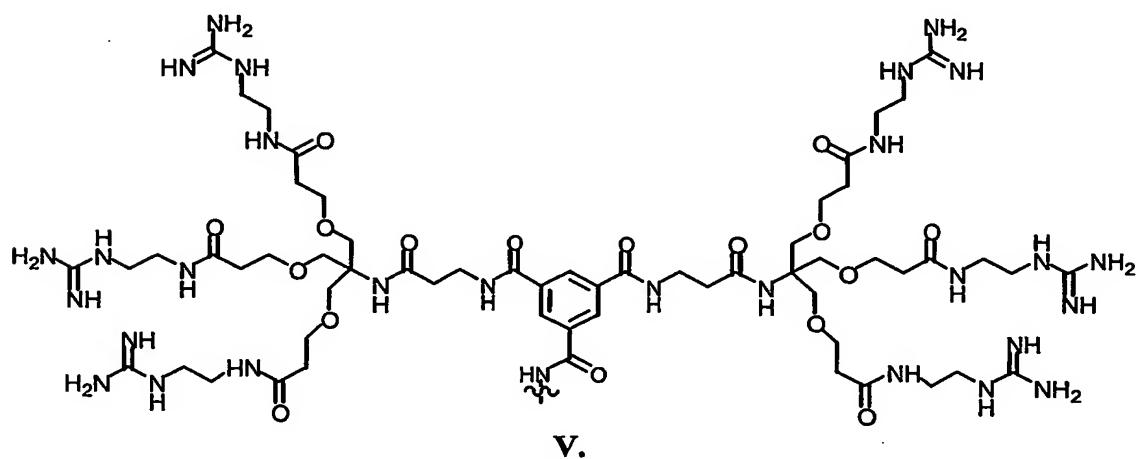
15. The transport molecule of any of Claims 1-14, wherein the dendrimer comprises at least one group having the formula III



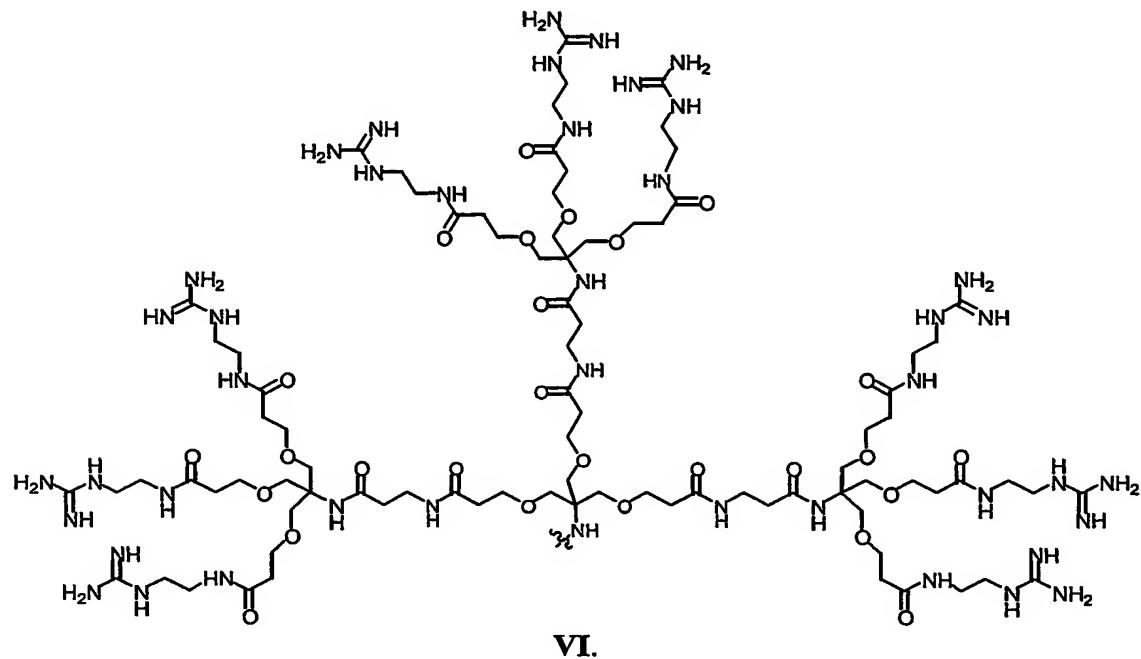
16. The transport molecule of any of Claims 1-15, wherein the dendrimer comprises at least one group having the formula IV



17. The transport molecule of Claim 1, wherein the dendrimer comprises a group of formula **V** or a protonated or a protected form of the group of formula **V**

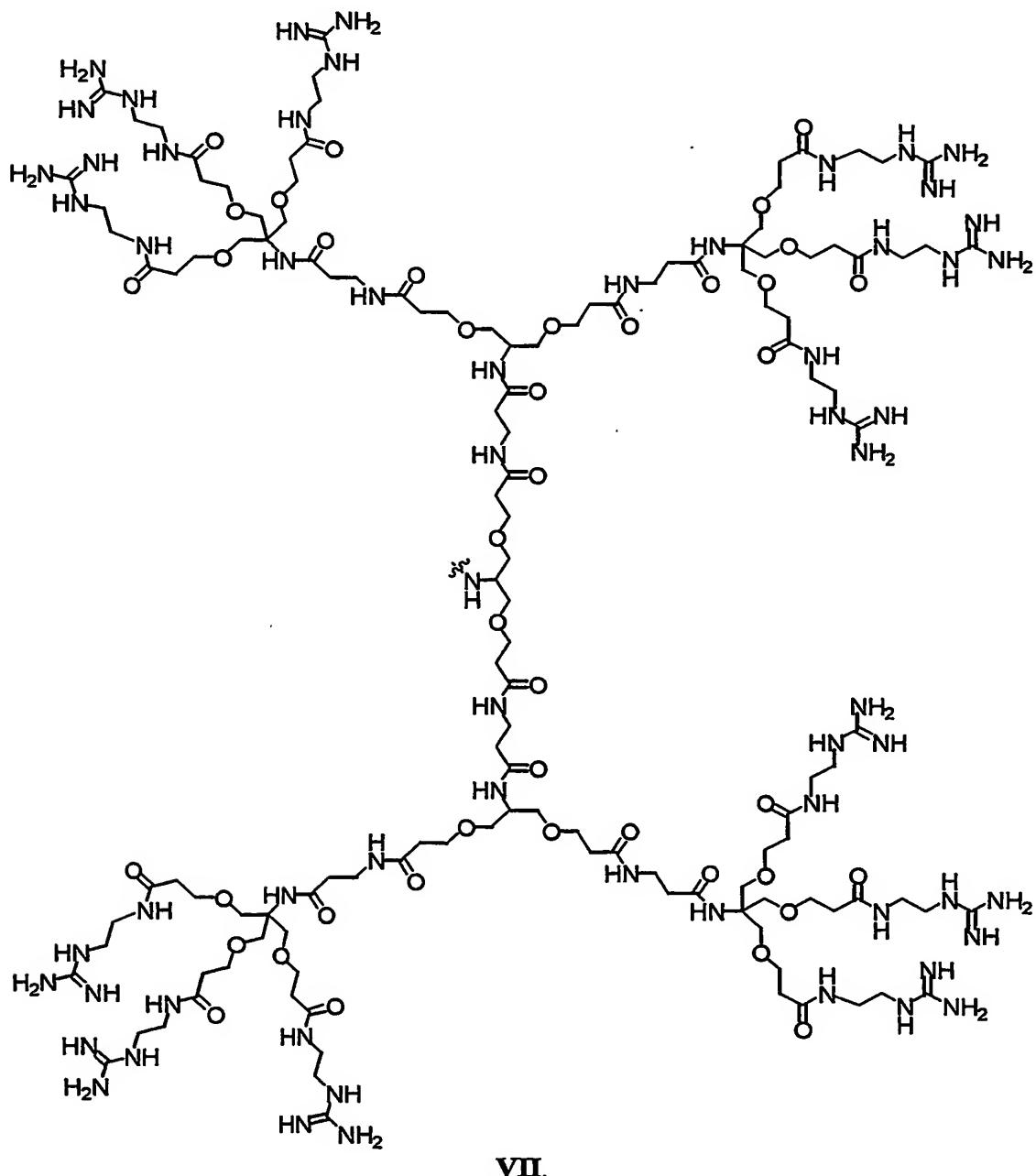


18. The transport molecule of Claim 1, wherein the dendrimer comprises a group of formula VI or a protonated or a protected form of the group of formula VI



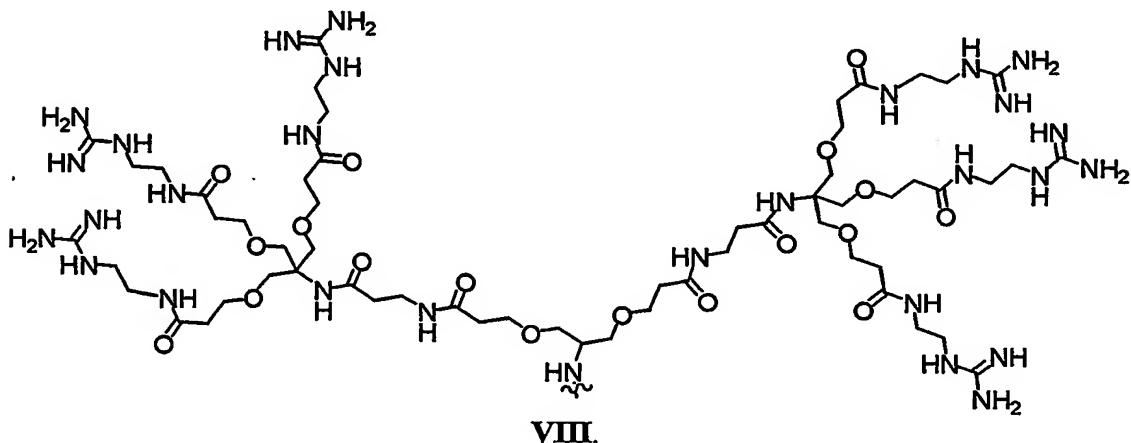
VI.

19. The transport molecule of Claim 1, wherein the dendrimer comprises a group of formula VII or a protonated or a protected form of the group of formula VII



VII.

20. The transport molecule of Claim 1, wherein the dendrimer comprises a group of formula **VIII** or a protonated or a protected form of the group of formula **VIII**



21. The transport molecule of any of Claims 1-20, wherein the biologically active molecule is bonded to the dendrimer through an amide or ester linkage.

22. The transport molecule of any of Claims 1-20, wherein the biologically active molecule is bonded to the dendrimer through a thiourea group.

23. The transport molecule of any of Claims 1-20, wherein the biologically active molecule is bonded to the dendrimer by reaction of a maleimide on the dendrimer with a reactive group on the biologically active molecule.

24. The transport molecule of any of Claims 1-20, wherein the biologically active molecule is bonded to the dendrimer through a covalent bond.

25. The transport molecule of any of Claims 1-24, wherein the biologically active molecule bonded to the dendrimer is selected from the group consisting of methotrexate, 5-fluorouracil, paclitaxel, cyclosporin A, and ganciclovir.

26. The transport molecule of any of Claims 1-24, wherein the biologically active molecule bonded to the dendrimer comprises a protein.

27. The transport molecule of Claim 26, wherein the protein has a size of less than 10 kDalton.

28. The transport molecule of Claim 26, wherein the protein has a size of more than 10 kDalton.

29. The transport molecule of any of Claims 1-24, wherein the biologically active molecule bonded to the dendrimer is a drug for the treatment of a mammalian condition.

30. A pharmaceutical formulation, comprising the transport molecule of claim 29 in combination with a pharmaceutically acceptable carrier.

31. A method of increasing the effectiveness of a drug, comprising administering the pharmaceutical formulation of Claim 30 to a human or an animal.

32. A method of increasing transport of a biologically active molecule across a biological membrane, comprising: contacting a biological membrane with a transport molecule according to any of Claims 1-24, wherein the transport molecule comprising the biologically active molecule bonded to the dendrimer is transported across the biological membrane at a rate greater than the biologically active molecule is transported across the biological membrane when the biologically active molecule is not bonded to the dendrimer of the transport molecule.

33. The method of claim 32, wherein the biologically active molecule comprises a protein.

34. The method of Claim 33, wherein the protein has a size of less than 10 kDalton.

35. The method of Claim 33, wherein the protein has a size of more than 10 kDalton.

36. A dendrimer, comprising at least two branch groups and two or more guanidine groups, protonated guanidine groups, or protected guanidine groups; two or

amidine groups, protonated amidine groups, or protected amidine groups; two or more ureido groups, protonated ureido groups, or protected ureido groups; two or more thioureido groups, protonated thioureido groups, or protected forms thioureido groups, wherein at least two of the two or more guanidine groups, protonated guanidine groups, or protected guanidine groups; amidine groups, protonated amidine groups, or protected amidine groups; ureido groups, protonated ureido groups, or protected ureido groups; or thioureido groups, protonated thioureido groups, or protected thioureido groups are borne at the end of the at least two branch groups of the dendrimer.

37. The dendrimer of claim 36, wherein the dendrimer comprises at least one tetravalent atom bonded to at least two branch groups that bear terminal guanidine groups, terminal protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups.

38. The dendrimer of claim 36, wherein the dendrimer comprises at least one tetravalent atom bonded to at least three branch groups that bear terminal guanidine groups, terminal protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups.

39. The dendrimer of claim 36, wherein the dendrimer comprises a first tetravalent atom and a second tetravalent atom, wherein the first tetravalent atom and the second tetravalent atom are each bonded to at least three branch groups that bear terminal guanidine groups, terminal protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido

groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups.

40. The dendrimer of claim 36, wherein the dendrimer comprises a first tetravalent atom, a second tetravalent atom, and a third tetravalent atom, wherein the first tetravalent atom, the second tetravalent atom, and the third tetravalent atom are each bonded to at least three branch groups that bear terminal guanidine groups, terminal protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups.

41. The dendrimer of claim 36, wherein the dendrimer comprises a first tetravalent atom, a second tetravalent atom, a third tetravalent atom, and a fourth tetravalent atom, wherein the first tetravalent atom, the second tetravalent atom, the third tetravalent atom, and the fourth tetravalent atom are each bonded to at least three branch groups that bear terminal guanidine groups, terminal protonated guanidine groups, terminal protected guanidine groups, terminal amidine groups, terminal protonated amidine groups, terminal protected amidine groups, terminal ureido groups, terminal protonated ureido groups, terminal protected ureido groups, terminal thioureido groups, terminal protonated thioureido groups, or terminal protected thioureido groups.

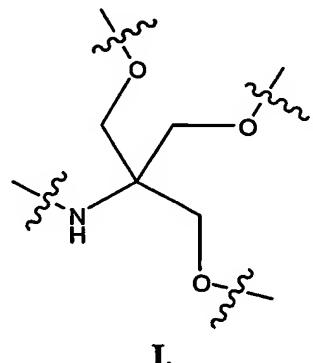
42. The dendrimer of claim 36, wherein the dendrimer possesses a degree of symmetry such that each of the guanidine groups, protonated guanidine groups, or protected guanidine groups; each of the amidine groups, protonated amidine groups, or protected amidine groups; each of the ureido groups, protonated ureido groups, or protected ureido groups; or each of the thioureido groups, protonated thioureido groups, or protected thioureido groups is in an identical chemical environment when each of the guanidine groups, protonated guanidine groups, or protected guanidine groups; each of the amidine groups protonated amidine groups, or protected amidine

groups; each of the ureido groups, protonated ureido groups, or protected ureido groups; or each of the thioureido groups, protonated thioureido groups, or protected thioureido groups is either neutrally charged or is protonated.

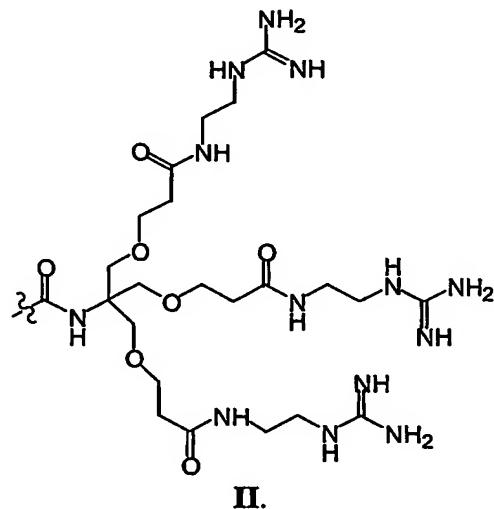
43. The dendrimer of any of Claims 36-42, wherein the dendrimer comprises amide bonds but does not comprise any peptide linkages.

44. The dendrimer of any of Claims 36-43, wherein the dendrimer comprises 3, 6, 9, or 12 guanidine groups, protonated guanidine groups, protected guanidine groups, amidine groups, protonated amidine groups, protected amidine groups, ureido groups, protonated ureido groups, protected ureido groups, thioureido groups, protonated thioureido groups, or protected thioureido groups.

45. The dendrimer of any of Claim 36-44, wherein the dendrimer comprises at least one residue of tris(hydroxymethyl)aminomethane, wherein the dendrimer comprises at least one group of formula I



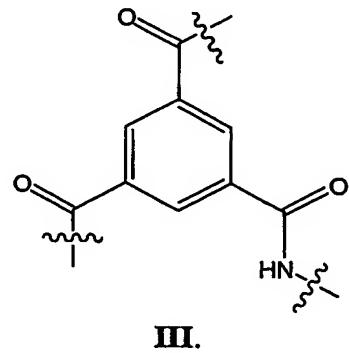
46. The dendrimer of Claim 45, wherein the dendrimer comprises at least one group of formula II or a protonated or a protected form of the group of formula II



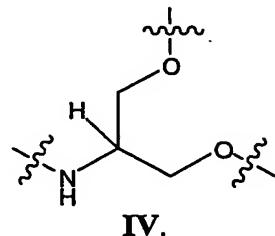
47. The dendrimer of Claim 45, wherein the dendrimer comprises one, two, three, or four groups of formula II or protonated or protected forms of the group of formula II.

48. The dendrimer of Claim 45, wherein the dendrimer comprises one, two, three, or four groups of formula I.

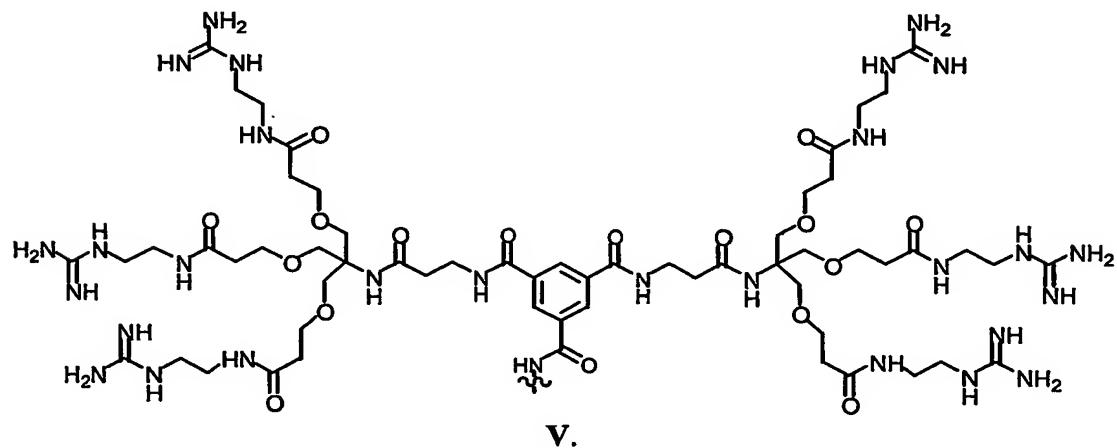
49. The dendrimer of any of Claims 36-48, wherein the dendrimer comprises at least one group having the formula III



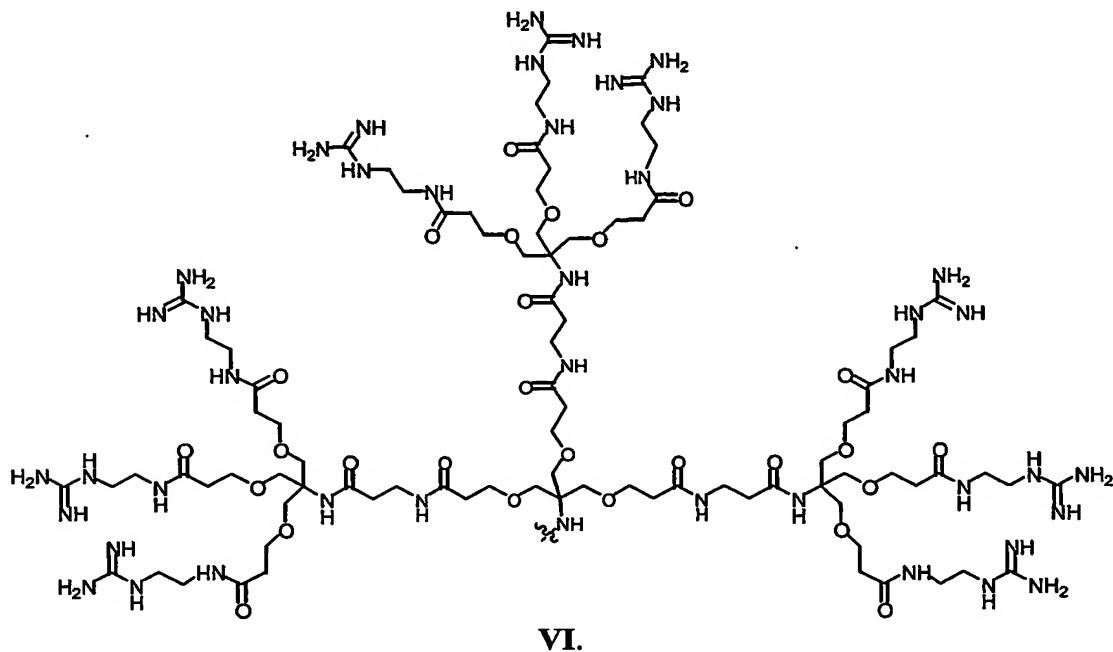
50. The dendrimer of any of Claims 36–49, wherein the dendrimer comprises at least one group having the formula IV



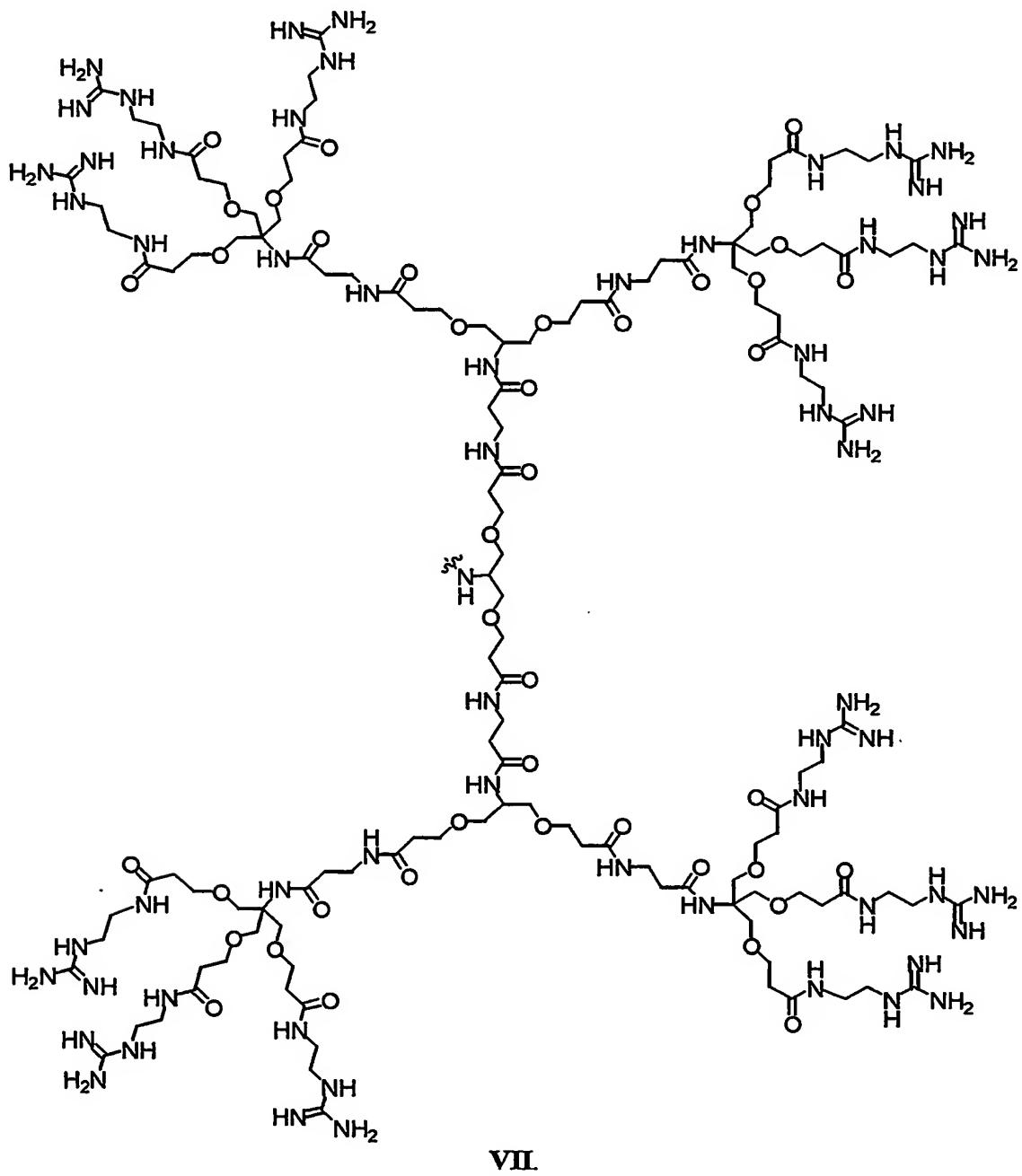
51. The dendrimer of Claim 36, wherein the dendrimer comprises a group of formula V or a protonated or a protected form of the group of formula V



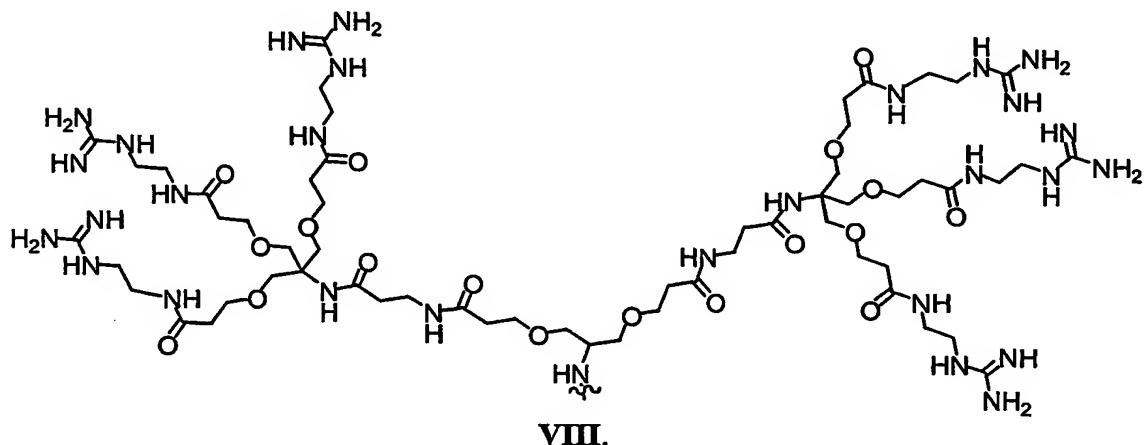
52. The dendrimer of Claim 36, wherein the dendrimer comprises a group of formula VI or a protonated or a protected form of the group of formula VI



53. The dendrimer of Claim 36, wherein the dendrimer comprises a group of formula VII or a protonated or a protected form of the group of formula VII



54. The dendrimer of Claim 36, wherein the dendrimer comprises a group of formula **VIII** or a protonated or a protected form of the group of formula **VIII**



55. A composition, comprising the dendrimer of any of Claims 36-54 and a detection molecule, wherein the detection molecule is bonded to the dendrimer.

56. The composition of Claims 55, wherein the detection molecule is fluorescein.

57. A method of synthesizing a dendrimer, comprising:

- (a) reacting a bis(hydroxyalkyl)aminoalkane or a tris(hydroxyalkyl)aminoalkane with a reactant selected from the group consisting of acrylonitrile, an acrylic ester, an α -haloester, and a cyclic anhydride and then esterifying to produce a diester comprising two ester groups and an amine group or a triester comprising three ester groups and an amine group;
- (b) protecting the amine group of the diester or the triester to produce a protected diester comprising two ester groups and a protected amine group or a protected triester comprising three ester groups and a protected amine group;
- (c) saponifying the two ester groups of the protected diester or the three ester groups of the protected triester to produce a dicarboxylic acid comprising two carboxylic acid groups and the protected amine group or a tricarboxylic acid comprising three tricarboxylic acid groups and the protected amine group;
- (d) reacting
 - (i) each of the carboxylic acid groups of the dicarboxylic acid or the tricarboxylic acid with a diaminoalkane, a diaminoalkene, a diaminocycloalkane, or a diaminocycloalkene to produce a product that comprises two or three amide-containing branches, wherein each of the amide-containing branches produced by the reaction of the carboxylic acid groups with the diaminoalkane, the diaminoalkene, the diaminocycloalkane, or the diaminocycloalkene comprises a protected amino group, wherein one of the amino groups of the diaminoalkane, the diaminoalkene, the diaminocycloalkane, or the diaminocycloalkene is protected; or
 - (ii) each of the carboxylic acid groups of the dicarboxylic acid or the tricarboxylic acid with a hydroxyaminoalkane, a hydroxyaminoalkene, a hydroxyaminocycloalkane, or a hydroxyaminocycloalkene to produce a product that comprises two or three ester-containing branches, wherein each of the ester-containing branches produced by the reaction of the

carboxylic acid groups with the hydroxyaminoalkane, the hydroxyaminoalkene, the hydroxyaminocycloalkane, or the hydroxyaminocycloalkene comprises a protected amino group, wherein the amino group of the hydroxyaminoalkane, the hydroxyaminoalkene, the hydroxyaminocycloalkane, or the hydroxyaminocycloalkene is protected;

(e) selectively deprotecting the protected amino groups at the end of the amide-containing or ester-containing branches introduced in (d) to produce a product with deprotected amine groups; and

(f) guanidinating, amidinating, ureidinating, or thioureidinating the product with deprotected amine groups produced after selectively deprotecting in (e) to produce the dendrimer.